



PATENT APPLICATION

PATENT AND TRADEMARK OFFICE

BEFORE THE HONORABLE BOARD OF PATENT APPEALS AND INTERFERENCES

In re the Application of

Makoto KOBAYASHI et al.

On Appeal from Group: 3723

Application No.: 09/830,434

Examiner: H. Shakeri

Filed: April 26, 2001

Docket No.: 109352

For: POLISHING PAD AND POLISHING METHOD FOR SEMI-CONDUCTOR WAFER

APPEAL BRIEF TRANSMITTAL

Commissioner for Patents
P.O. Box 1450
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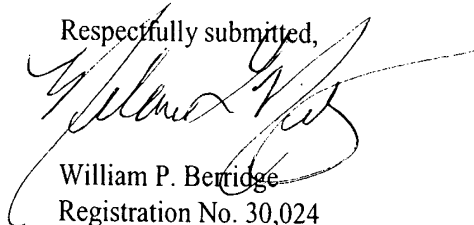
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Respectfully submitted,



William P. Berridge
Registration No. 30,024

BEST AVAILABLE COPY

Melanie L. Mealy
Registration No. 40,085

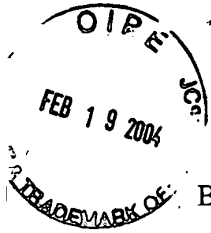
Christopher W. Brown
Registration No. 38,025

WPB:MLM:CWB/rav
Date: February 19, 2004

OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400

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PATENT APPLICATION



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Group Art Unit: 3723

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BRIEF ON APPEAL

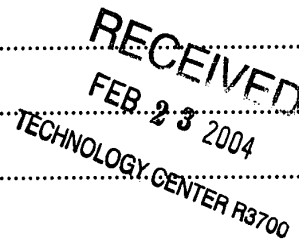
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Appeal from Group 3723

OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400
Attorneys for Appellants

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I. INTRODUCTION

This is an Appeal from the non-final Office Action mailed November 21, 2003 rejecting claims 11-13, 17, 18, 20, 21 and 27-30 of the present application under 35 U.S.C. §103(a) relying upon Applicants' Admitted Prior Art in view of U.S. Patent No. 6,004,402 (Cerccone).

This appeal is proper and timely because, although the Office Action is non-final, the Examiner has maintained the rejection of the claims under 35 U.S.C. §103(a) relying upon Applicants' Admitted Prior Art in view of U.S. Patent No. 6,004,402 (Cerccone) for two consecutive Office Actions (37 CFR 1.191(a) and MPEP §1205). See page 3 of the June 17, 2003 Office Action and pages 2-3 of the November 21, 2003 Office Action.

A. Real Party In Interest

The real party in interest for this Appeal in the present application is Shin-Etsu Handotai Co., Ltd., which received title by way of an Assignment recorded in the U.S. Patent and Trademark Office at Reel 011825, Frame 0975.

B. Statement of Related Appeals and Interferences

There are presently no appeals or interferences, known to Appellants, Appellants' representative or the assignee, which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending Appeal.

C. Status of Claims

Claims 11-13, 17, 18, 20, 21 and 27-30 are pending and are on appeal. Claims 11-13, 17, 18, 20, 21 and 27-30 stand rejected on the grounds discussed further below. A copy of the claims on appeal are set forth in the attached Appendix.

Claim 11 is an independent claim from which claims 17 and 27 depend. Claim 12 is an independent claim from which claims 18 and 28 depend. Claim 13 is an independent

claim from which claim 29 depends. Claim 20 is an independent claim from which claims 21 and 30 depend.

D. Status of Amendments

No Amendment or Request for Reconsideration has been filed in response to the November 21, 2003 non-final Office Action. The claim amendments submitted in the Amendment After Final Rejection filed on September 17, 2003 were entered upon the filing of the Request for Continuing Examination (RCE) filed on October 17, 2003.

II. SUMMARY OF THE INVENTION

Independent claims 11, 12, 13 and 20 each recite a polishing pad used for polishing a semiconductor wafer while supplying a polishing agent onto the polishing pad in a mirror polishing process, wherein the polishing pad comprises a base layer formed of nonwoven fabric and a porous surface layer formed of foamed polyurethane. Independent claim 11 requires that the content of zinc oxide (ZnO) included in the polishing pad is 200ppm or less at the ratio of zinc weight relative to the weight of the polishing pad. Independent claim 12 requires that the content of zinc oxide (ZnO) included in the polishing pad is 100ppm or less at the ratio of zinc weight relative to the weight of the polishing pad. Independent claim 13 requires that the polishing pad does not include zinc oxide (ZnO). Independent claim 20 requires that the content of zinc oxide (ZnO) included in the porous surface layer is 100ppm or less at the ratio of zinc weight relative to the weight of the porous surface layer.

As described on page 14, line 9 through page 15, line 8 of the specification, the present inventors found that minute polishing damages were generated by using a conventional finish polishing pad in a mirror-polishing process of a semiconductor wafer. The inventors examined the polishing damages generated in the polishing process, and found that the cause is zinc compounds (zinc oxide), which were added in manufacturing of the

polishing pad for increasing the hardness of a nonwoven fabric of the polishing pad and as a stabilizer against light in a manufacturing step of urethane resin.

Accordingly, it was discovered that if the content of zinc oxide (ZnO) included in a polishing pad comprising a base layer formed of nonwoven fabric and a porous surface layer formed of foamed polyurethane is kept within the amount ranges recited in each of independent claims 11, 12, 13 and 20, a semiconductor wafer can be finished without polishing damages and cloudiness. See page 8, lines 9-16; page 11, lines 4-17; page 19, lines 8-18; etc. in the specification.

III. THE APPLIED REFERENCES

- A. Applicants' Admitted Prior Art
- B. U.S. Patent No. 6,004,402 to Cercone et al. (hereinafter "Cercone").

IV. ISSUE

The issue on appeal is as follows:

Would the subject matter recited in claims 11-13, 17, 18, 20, 21 and 27-30 have been obvious to one of ordinary skill in the art from the teachings of Applicants' Admitted Prior Art in view of Cercone?

V. GROUPING OF CLAIMS

For purposes of this Appeal, the rejected claims are grouped as follows:

- Group I - Claims 11, 12, 17, 18 and 20;
- Group II - Claims 13 and 21; and
- Group III - Claims 27-30.

The Groups do not stand or fall together and are separately patentable for the reasons discussed in the separate arguments below.

VI. ARGUMENTS

A. Claims 11, 12, 17, 18 and 20

The presently claimed invention, as defined in independent claims 11, 12 and 20, relates to a polishing pad used for polishing a semiconductor wafer while supplying a polishing agent onto the polishing pad in a mirror polishing process, wherein the polishing pad comprises a base layer formed of nonwoven fabric and a porous surface layer formed of foamed polyurethane, and wherein the content of zinc oxide (ZnO) included in the polishing pad is 200ppm or less at the ratio of zinc weight relative to the weight of the polishing pad (claim 11) or wherein the content of zinc oxide (ZnO) included in the polishing pad is 100ppm or less at the ratio of zinc weight relative to the weight of the polishing pad (claim 12) or wherein the content of zinc oxide (ZnO) included in the porous surface layer is 100ppm or less at the ratio of zinc weight relative to the weight of the porous surface layer (claim 20). Appellants respectfully submit that none of the cited art teaches or suggests a polishing pad having the structural or material limitations recited in each of these claims.

In the rejection, the Examiner alleged that the Admitted Prior Art described the structure and materials of the claimed polishing pad, with the exception of not disclosing the limitations regarding the amount of zinc oxide present in the polishing pad (claims 11 and 12)/porous surface layer of the polishing pad (claim 20). However, the Examiner then alleged that Cercone would have suggested modification of the Admitted Prior Art to reduce the amount of zinc oxide (ZnO) therein to within the claimed ranges. Appellants respectfully submit that one of ordinary skill in the art would not have been led to have combined the teachings of the Admitted Prior Art with Cercone and moreover, even if combined, the presently claimed invention still would not have been achieved.

1. The Teachings Would Not Have Been Combined

The Admitted Prior Art was alleged to be comprised of a polishing pad having a nonwoven fabric base layer and a polyurethane foam porous surface layer.

Cercone, on the other hand, describes a cleaning sponge comprised of polyvinyl acetal. In particular, Cercone describes that prior art polyvinyl acetal sponges have a structure tending to trap residue and trace metals, which metals can come out of the sponge upon wear of the sponge and damage a surface to be cleaned, for example a silicon semiconductor wafer surface. See column 1, lines 26-40. It is also taught at column 1, line 66 to column 2, line 4 that although extraction processes have been used to remove metal particulate matter and residue from sponges, such extraction procedures have not been effective. Cercone thus describes a particular extraction procedure, intimately tied to the method of making the polyvinyl acetal of the sponge, that is indicated to effectively remove metals such as zinc and calcium found problematic in cleaning procedures.

Cercone thus differs from the Admitted Prior Art and the presently claimed invention in several significant respects, including (1) describing a sponge for cleaning, and the properties that should be associated with a cleaning sponge, instead of a pad for polishing and properties thereof, (2) describing an extraction process specific to polyvinyl acetal, and (3) describing a procedure for extracting metals such as zinc, but having no teachings regarding zinc oxide. In view of these significant differences, nothing in Cercone would have led one of ordinary skill in the art to have applied the teachings of Cercone to the Admitted Prior Art.

Cercone describes a polyvinyl acetal sponge material that has a low amount of metal such as zinc therein, e.g., 2 ppm or less. Cercone relates entirely to a polyvinyl acetal sponge for cleaning a silicon semiconductor wafer that has previously been subjected to polishing, and not to polishing the wafer at all. Such a cleaning sponge is completely different from the

polishing pad for making a surface of a wafer flat with high precision (mirror-polishing) by eliminating the non-uniformity of surface roughness as in the present invention.

The Examiner alleged on page 3 of the Office Action that Cercone describes that polyvinyl acetal sponges have been used for cleaning and polishing, citing column 3, lines 10-14 of Cercone, and thus that Cercone suggests that the teachings therein apply to polishing pads. However, Cercone here merely indicates that a prior art polyvinyl acetal material was used in cleaning and polishing rolls. Appellants submit that this singular mention of polishing in Cercone does not indicate any teaching or suggestion to use the polyvinyl acetal cleaning sponge of Cercone in a polishing procedure. In fact, in view of the teachings in Cercone exclusively directed to the properties required of the polyvinyl acetal sponge used in cleaning, one of ordinary skill in the art would not have found Cercone relevant to polishing pads at all. That is, one of ordinary skill in the art would not have looked to Cercone for any teachings with respect to possibly modifying the Admitted Prior Art polishing pads.

The Examiner has dismissed the foregoing arguments as irrelevant on the grounds that the polishing pad limitations are allegedly merely an intended use. However, the Examiner ignores the fact that the Patent Office must establish motivation for one of ordinary skill in the art to have combined the teachings of the references in the manner alleged. In this regard, it is highly relevant that Cercone describes properties that a polyvinyl acetal sponge should possess when used for cleaning a wafer, whereas the Admitted Prior Art is directed to a different pad for a different use (polishing). These differences are quite significant, and indicate clearly that one of ordinary skill in the art would not have been motivated to have turned to Cercone in seeking to modify the Admitted Prior Art polishing pad.

This lack of motivation to combine the references is further underscored by the fact that the teachings of Cercone concerning extracting metals are directed solely to polyvinyl acetal materials. One would not have been led to have combined these extraction procedures

to the very different polishing pad of the Admitted Prior Art comprised of a nonwoven fabric base layer and a polyurethane foam porous surface layer.

For example, Cercone teaches at column 1, line 66 to column 2, line 4 that conventional extraction procedures are not sufficient for polyvinyl acetal materials. At column 4, Cercone describes that the polyvinyl acetal sponge of the invention is derived with a new extraction procedure in which the cross-linking of the material is stopped before completion, and the material is then subjected to alternating solutions of high and low pH. See in particular the first extraction procedure at column 4, lines 9-41 and the second extraction procedure at column 4, line 52 to column 5, line 15 of Cercone. These procedures are clearly directed specifically to making cross-linked polyvinyl acetal sponges. There is no indication in Cercone that such harsh conditioning could be used with a polishing pad including a nonwoven fabric base layer and a polyurethane foam porous surface layer, or that such extraction procedures would have the effect of eliminating zinc oxide (as opposed to zinc metals as in Cercone) from such different polishing pad. Such even further indicates that one of ordinary skill in the art would not have been led by the teachings of Cercone, directed to an extraction procedure particular to polyvinyl acetal, to have applied such teachings to the nonwoven fabric/polyurethane foam polishing pad of the Admitted Prior Art.

Finally, Appellants submit that there are no teachings in Cercone that would have led one of ordinary skill in the art to believe any modification of the Admitted Prior Art polishing pad was needed for any reason at all. Cercone teaches that in making a polyvinyl acetal sponge for cleaning, such sponge should be subjected to a particular extraction process to substantially eliminate metals such as zinc from the cleaning sponge. However, as the Admitted Prior Art pad is not made of polyvinyl acetal and is not used for cleaning, and was found by the present inventors to have a problem with zinc oxide rather than metals per se as in Cercone, one of ordinary skill in the art would not have been motivated to have applied the

teachings of Cercone to the Admitted Prior Art pad for any reason or with any reasonable expectation of success. It is clearly only through the use of improper hindsight that one could have combined the references in the manner set forth by the Examiner.

2. The Combined Art Would not Have Achieved the Claimed Invention

Further, even if the teachings of the art would have somehow been combined as alleged by the Examiner, the presently claimed invention still would not have been achieved.

As discussed above, Cercone describes an extraction procedure in which metals such as zinc are extracted from polyvinyl acetal. While the amount of zinc metal in the polyvinyl acetal is reduced to less than 2 ppm by the extraction procedures, nothing in Cercone indicates that such extraction procedures would remove zinc oxide. Still further, nothing in Cercone indicates that if the extraction procedures were to be applied to a different material such as a nonwoven fabric base layer/polyurethane foam porous surface layer, that zinc metals or zinc oxide would be removed. As such, nothing in Cercone indicates that the combined teachings of the references would have led to a polishing pad comprised of a nonwoven fabric base layer and a polyurethane foam porous surface layer with the amounts of zinc oxide recited in the claims, either inherently or explicitly.

Thus, even if the art had been combined as alleged by the Examiner, Appellants submit that the claimed invention still would not have been achieved.

B. Claims 13 and 21

In addition to all of the foregoing reasons, claims 13 and 21 are further not taught or suggested by the Admitted Prior Art in view of Cercone.

Each of claims 13 and 21 requires that the polishing pad not contain zinc oxide. There is no indication in Cercone that this result could be achieved. In Tables 2 and 4 of Cercone, it is indicated that even after the rigorous extraction procedures described in Cercone, the polyvinyl acetal cleaning sponge still contains some amount of zinc. Following

the Examiner's logic that apparently equates metals such as zinc with zinc oxide, Cercone indicates that a cleaning sponge not containing any zinc oxide could not be achieved.

For this additional reason, the Admitted Prior Art in view of Cercone should also be found not to have rendered obvious the polishing pad of claims 13 and 21.

C. Claims 27-30

Each of claims 27-30 recites a method for polishing a semiconductor wafer, comprising performing polishing of the semiconductor wafer with the polishing pad of claims 11-13 and 20, respectively, while supplying a polishing agent onto the polishing pad.

In addition to all of the reasons discussed above with respect to claims 11-13, 17, 18, 20 and 21, Appellants submit that Cercone would not have been combined with the Admitted Prior Art in a manner that would have led one of ordinary skill in the art to the methods recited in claims 27-30.

Specifically, Cercone describes that if a polyvinyl acetal sponge is to be used for cleaning a silicon semiconductor wafer surface, it should be made to be as free of metals and residues as possible. Cercone nowhere teaches or suggests any properties that such a sponge should possess if used for the different process of polishing the surface of the wafer as in the claimed methods. Thus, nothing in the cleaning procedures described in Cercone would have led one to have applied the teachings of Cercone to the polishing methods of the Admitted Prior Art that use a different pad for a different procedure. The polishing methods of claims 27-30 using the polishing pads of claims 11-13 and 20, respectively, thus would not have been derived from the Admitted Prior Art in view of Cercone.

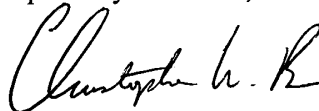
D. Conclusion

For at least the foregoing reasons, Appellants respectfully submit that the Admitted Prior Art in view of Cercone, alone or in combination, would not have led one of ordinary skill in the art to the claimed invention.

VII. CONCLUSION

For all of the reasons discussed above, it is respectfully submitted that it would not have been known or obvious to a person of ordinary skill in the art, at the time the invention was made, to make the subject invention from the teachings of any of the art relied upon by the Examiner, taken alone or in any combination. Appellants respectfully request that this Honorable Board reverse the rejection of claims 11-13, 17, 18, 20, 21 and 27-30.

Respectfully submitted,



William P. Berridge
Registration No. 30,024

Christopher W. Brown
Registration No. 38,025

WPB:CWB/rav

Date: February 19, 2004

OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400

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